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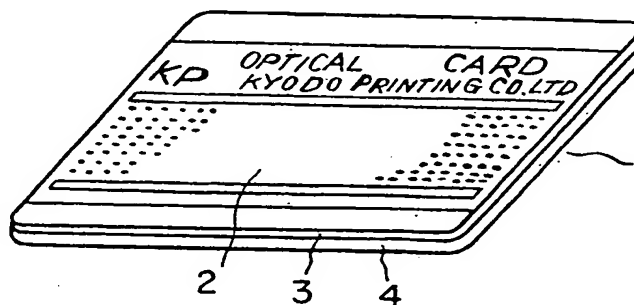
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⑤④ Optical recording card and method of producing the same.

⑤⑦ This invention is concerned with a DRAW type optical recording card and a method of producing the same. The optical recording card of the invention is so constructed that an optical recording member is held between a card front board and a card rear board. The optical recording member is constructed by a colored organic material layer and an aluminum deposited layer in the form of a layered structure or by a colored organic material layer and a transparent figure image forming layer in the form of a layered structure. When optical informations are written in the optical recording member, a laser beam is emitted from the outside of the card front board whereby a pit is formed on the optical recording member.

FIG. 1



EP 0 272 875 A2

## Description

## OPTICAL RECORDING CARD AND METHOD OF PRODUCING THE SAME

The present invention relates to an optical recording card and a method of producing the same and more particularly to a writable optical recording card (DRAW type optical recording card) and a method of producing the same.

In the recent years, a card in which various kinds of informations are recorded has been widely used as ID card, cash card or bank card.

This kind of card is required to record various kinds of informations such as individual data, data concerning issuance company or the like. In the earlier age, such kinds of informations were recorded using visual characters and symbols and in the later age they have been recorded using electrical signals which are produced with the aid of magnetism. However, in the case where magnetic recording medium is used, recorded informations are easy to be forged or falsified and moreover a quantity of informations to be recorded is limited. Accordingly, there is a need to taking adequate actions for preventing the recorded informations from being forged or falsified and dealing with the current increased quantity of informations to be recorded.

To this end, an optical recording card to which a laser technique is applied has been lately developed. This optical recording card is such that it is provided with an information recording medium which has an optical reflection surface. Lately, a writable type (DRAW type) information recording medium has been required in addition to a conventional read only memory type (ROM type) information recording medium.

As shown in Fig. 8, a conventional DRAW type optical recording card 101 is so constructed that a nonfilamentary silver layer 108 is formed on a card front board 102, a black filamentary silver layer 107 is formed beneath the nonfilamentary silver layer 108 and a card rear board 103 is adhesively secured to the black filamentary layer 107. A surface hardening layer 106 is formed on the surface of the card front board 102, which a protective layer 105 is formed on the surface of the card rear board 103.

A laser beam 200 for the purpose of writing is emitted from the surface hardening layer 106 side to melt the nonfilamentary silver layer 108, causing the black filamentary layer 107 to be exposed to the outside, whereby a pit 111 is formed in which informations are recorded. Reading of the recorded informations is achieved by discriminating "0" from "1" in dependence on an intensity ratio of reflected lights from the black filamentary silver layer 107 and the nonfilamentary silver layer 108.

However, the nonfilamentary silver layer used in the optical recording card as constructed in the above-described manner is expensive, has a low moisture resistance and moreover is inferior in stability for a long period of time.

On the other hand, as a technique for producing an optical recording card there is known such a technique that a separately prepared optical recor-

ding member is held between the card front board and the card rear board to assume a shape of card. In the case of the above-mentioned technique, the recording surface of the optical recording member has a low surface flatness. Further, there is a need of providing a base film for supporting the optical recording member. When a card is produced by employing the technique, the result is that produced cards fail to have a uniform thickness. Moreover, it is required that a card retaining mechanism is designed in other type. Consequently, a card reader becomes complicated in structure.

The present invention has been made with the foregoing background in mind and its object resides in providing an optical recording card in which data can be written and which can be easily produced at an inexpensive cost as well as a method of producing the optical recording card as mentioned above.

To accomplish the above object, there is provided according to one aspect of the invention an optical recording card wherein a writable optical recording member is held between a card front board and a card rear board which are adhesively secured to one another with the use of an adhesive, the optical recording member includes a colored organic material layer and an aluminum deposited layer in the form of a layered structure, and the optical recording member is held between the card front board and the card rear board in such a manner that the colored organic material layer is located on the writing light emitting side.

Further, there is provided according to other aspect of the invention a method of producing an optical recording card of the type including a writable optical recording member which is held between a card front board and a card rear board which are adhesively secured to one another with the use of an adhesive, wherein the method comprises the steps of forming a colored organic material layer in an optical recording member forming region located on one surface of the transparent card front board, next, forming an aluminum depositing layer on the colored organic material layer and then, adhesively securing the card rear board to the card front board in such a manner as to cover the colored organic material layer and the aluminum deposited layer.

Further, there is provided according to another aspect of the invention an optical recording card wherein a writable optical recording member is held between a card front board and a card rear board which are adhesively secured to one another with the use of an adhesive, the optical recording member includes a colored organic material layer and a transparent figure image forming material layer in the form of a layered structure, and the optical recording member is held between the card front board and the card rear board in such a manner that the colored organic material layer is located on the writing light emitting side.

Furthermore, there is provided according to further another aspect of the invention a method of producing an optical recording card of the type including a writable optical recording member which is held between a card front board and a card rear board which are adhesively secured to one another with the use of an adhesive, wherein the method comprises the steps of forming a colored organic material layer in an optical recording member forming region on one surface of the transparent card front board, next, forming a transparent figure image forming material layer on the colored organic material layer, and then, adhesively securing the card front board to the card rear board in such a manner as to cover the colored organic material layer and the transparent figure image forming material layer.

Other objects, features and advantages of the present invention will become readily apparent from reading of the following description which has been made in conjunction with the accompanying drawings.

The present invention will be illustrated in the accompanying drawing in which;

Fig. 1 is a perspective view illustrating an optical recording card in accordance with an embodiment of the present invention.

Fig. 2 is a fragmental enlarged sectional view of the optical recording card in Fig. 1.

Fig. 3 illustrates the steps of producing the optical recording card in Fig. 1.

Fig. 4 is a fragmental enlarged sectional view of the optical recording card in Fig. 1, particularly illustrating a state of writing of informations in the optical recording card.

Fig. 5 is a fragmental enlarged sectional view of an optical recording card in accordance with other embodiment of the present invention.

Fig. 6 illustrates the steps of producing the optical recording card in Fig. 5.

Fig. 7 is a fragmental enlarged sectional view of the optical recording card in Fig. 5, particularly illustrating a state of writing of informations in the optical recording card, and

Fig. 8 is a fragmental enlarged sectional view of a conventional optical recording card.

Now, the present invention will be described in a greater detail hereunder with reference to the accompanying drawings which illustrate preferred embodiments thereof.

In Figs. 1 and 2, reference numeral 1 designates an optical recording card. A thickness of the optical recording card 1 is set to about 0.76 mm. The optical recording card 1 includes an optical recording section 2. The optical recording card 1 is so constructed that an optical recording member 7 is formed in an optical recording member forming region 5 located inwardly of a card front board 3 and moreover a card rear board 4 is adhesively secured to the optical recording member 7 with an adhesive layer 13 interposed therebetween in such a manner as to cover the optical recording member 7.

The card rear board 4 is intended to assure a strength of the optical recording card 1, and a plate of glass or synthetic resin such as acrylic resin,

epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like is employable as material constituting the card rear board 4.

The card front board 3 has a thickness of about 0.4 mm and it is constituted by material having an excellent light permeability such as glass or transparent resin such as polycarbonate resin, acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like or at least the optical recording member forming region 5 corresponding to the optical recording section 2 has a light permeability.

The optical recording member 7 is constituted by a colored organic material layer 11 and an aluminium deposited layer 12 to build a layered structure. The colored organic material layer 11 is formed on the card front board 3 to have a thickness in the range of 300 angstroms to 10 microns. As material constituting the colored organic material layer 11, for instance, a solution which is prepared as dyestuff adapted to absorb light having a wave length of about 830 nm by dissolving NK2014 or NK125 (both of them being produced by Nippon Kanko-Shikiso Kenkyusho Co., Ltd.), IR-820 (produced by Nippon Kayaku Co., Ltd.) or the like in a mixture of cyclohexanone and dichloromethane having a mixing ratio of 1 : 1 by 1 % by weight is employable.

The aluminium deposited layer 12 is formed on the colored organic material layer 11 by a process of vacuum depositing to have a thickness less than 1000 angstroms. Further, a preformat can be added to the optical recording member 7 by a process of dyeing.

Next, description will be made below with reference to Fig. 3 as to a method of producing the optical recording card as constructed in the above-described manner.

First, a colored organic material 11a is coated on the high surface flatness card front board 3 by spin coating or the like process. Incidentally, a pregroove address or the like may be previously formed on the high surface flatness card front board 3 by a process of die pressing or with the use of ultraviolet ray hardenable resin, as required. Further, a preformat may be previously formed on the high surface flatness card front board 3 by printing or the like process. As colored organic material 11a, a solution which is prepared by dissolving NK2014 or NK125 (both of them being produced by Nippon Kanko-Shikiso Kenkyusho Co., Ltd.), IR-820 (produced by Nippon Kayaku Co., Ltd.) or the like in a mixture of cyclohexanone and dichloromethane having a mixing ratio of 1 : 1 by 1 % by weight is used by a process of coating and after completion of the coating it is subjected to drying. After it is dried, it has a thickness of about 500 angstroms (see Fig. 3(a)).

Next, a vaporized aluminum 12a is deposited on the colored organic material 11a by a process of vacuum depositing (see Fig. 3(b)). After completion of the depositing, it has a thickness of about 500 angstroms.

Next, the aluminum 12a is removed by patterning

with the exception of a part corresponding to the optical recording member forming region 5. This causes the aluminium deposited layer 12 to be formed (see Fig. 3(c)).

Next, the colored organic material 11a is dissolved by using the aluminium deposited layer 12 as a mask whereby the colored organic material layer 11 is formed.

The optical recording member 7 is completed by way of the steps as mentioned above (see Fig. 3(d)).

Next, an adhesive layer 13 is coated from the above of the optical recording member 7 (see Fig. 3(e)) and the card rear board 4 is then adhesively secured to the optical recording member 7 with the adhesive layer 13 interposed therebetween (see Fig. 3(f)).

Finally, the completed layered structure is punched to assume a predetermined shape as a card whereby the required optical recording card 1 is completed (Fig. 3(g)).

When optical informations are written in the optical recording card 1 as constructed in the above described manner, as shown in Fig. 4, a laser beam is emitted onto the colored organic material layer 11 from the above of the card front board 3 of the optical recording card 1. This causes material in a part of the colored organic material layer 11 onto which the laser beam has been emitted to the molten whereby a part of the aluminum deposited layer 12 is exposed to the outside to form a pit 10. Reading of the pit 10 is achieved by presence of absence of a reflected light from the colored organic material layer 11 and the aluminum deposited layer 12 or by a degree of intensity of the reflected light.

As will be apparent from the above description, the optical recording card of the present invention is inexpensive, and moreover it is easy to produce the optical recording member, because the colored organic material layer and the aluminum deposited layer can be formed by employing a well-established method in relation to a conventional thin film forming technique. Thus, the optical recording member can be easily produced and therefore the optical recording card of the invention itself can be easily produced at an inexpensive cost.

Further, since the optical recording member is adhesively enveloped between the card front board and the card rear board with the aid of an adhesive, it can maintain stability for a long period of time.

Moreover, since the optical recording member is formed directly on the high surface flatness card front board, the recording surface of the optical recording member is excellent in surface flatness and a performance of adhesion of the optical recording member to the card front surface is excellent too.

Next, description will be made below as to an optical recording card in accordance with another embodiment of the invention.

As shown in Fig. 5, an optical recording member 7 is constituted by a colored organic material layer 11 and a transparent figure image forming material layer 112 to build a layered structure. The colored organic material layer 11 is formed on the high surface flatness card front board 3 to have a thickness in the

range of 300 angstroms to 10 microns. For instance, a solution which is prepared by dissolving NK2014 or NK125 (both of them being produced by Nippon Kanko-Shikiso Kenkyusho Co., Ltd.), IR-820 (produced by Nippon Kayaku Co., Ltd.) or the like in a mixture of cyclohexanone and dichloromethane having a mixing ratio of 1 : 1 by 1 % by weight is employable as material constituting the colored organic material layer 11.

The transparent figure image forming material layer 112 is formed on the colored organic material layer 11 to have a thickness in the range of 0.1 to 50 microns. For instance, G-90 (produced by Tokyo Ohka kogyo Co., Ltd.), gelatin, PVA or the like are employable as transparent figure image building material. Incidentally, a plurality of optical recording members 7 may be formed one above another.

Next, description will be made below the reference to Fig. 6 as to a method of producing the optical recording card as constructed in the above-described manner.

First, a colored organic material 11a is coated on the high surface flatness card front board 3 by a process of spin-coating or the like. As colored organic material 11a, a solution which is prepared by dissolving NK2014 or NK125 (both of them being produced by Nippon Kanko-Shikiso Kenkyusho Co., Ltd.), IR-820 (produced by Nippon Kayaku Co., Ltd.) or the like in a mixture of cyclohexanone and dichloromethane having a mixing ratio of 1 : 1 by 1 % by weight is used by a process of coating. After completion of the coating, it is subjected to drying. After it is dried, it has a thickness of about 500 angstroms (see Fig. 6(a)).

Next, a transparent figure image building material 112a is coated on the colored organic material 11a by a process of spin-coating (see Fig. 6(b)). As transparent figure image building material 112a, a mixture comprising 10 parts of G-90 (produced by Tokyo Ohka kogyo Co., Ltd.) and 1 part of 1.0 % ammonium dichromate is employable. After completion of the coating, it is subjected to drying. After it is dried, it has a thickness of about 0.4 micron.

Next, the transparent figure image forming material 112a is removed by patterning with the exception of a part corresponding to the optical recording member forming region 6. This causes a transparent figure image building layer 112 to be formed (see Fig. 6(c)).

Next, a colored organic material layer 11 is formed by dissolving the colored organic material 11a by using the transparent figure image building material layer 112 as a mask.

An optical recording member 7 is completed by way of the steps as described above (see Fig. 6(d)).

Next, an adhesive layer 13 is coated from the above of the optical recording member 7 (see Fig. 6(e)) and the card rear board 4 is adhesively secured to the optical recording member 7 with the adhesive layer 13 interposed therebetween (see Fig. 6(f)).

Finally, the completed layered structure is punched to assume a predetermined shape as a card whereby the optical recording card 1 is completed (see Fig. 6(g)).

When optical informations are written onto the optical recording card 11 as constructed in the above-described manner, as shown in Fig. 7, a laser beam is emitted onto the colored organic material layer 11 from the above of the card front board 3 of the optical recording card 1. This causes a part of the colored organic material layer 11 onto which the laser beam has been emitted to be deformed. At the same time, this deformation is absorbed by dissolution of the transparent figure image forming material layer 112 whereby a pit 10 is formed by concavities and convexities which are representative of the surface state of the colored organic material layer 11. Reading of the pit 10 is achieved by presence of absence of reflected light from the concavities and convexities representative of the surface state of the colored organic material layer 11 or a degree of intensity of the reflected light.

As will be apparent from the above description, the optical recording card of the invention is inexpensive, and the colored organic material layer and the transparent figure image forming material layer can be formed by employing a well-established method in relation to a conventional thin film forming technique. Thus, the optical recording member can be easily produced and therefore the optical recording card of the invention itself can be easily produced at an inexpensive cost.

Further, since the optical recording member is adhesively enveloped between the card front board and the card rear board with the use of an adhesive, it has stability for a long period of time.

Moreover, since the the optical recording member is formed directly on the high surface flatness card front board, the recording surface of the optical recording member is excellent in surface flatness and an intensity of adhesion of the optical recording member to the card front board is excellent too.

While the present invention has been described above with respect to a few preferred embodiments thereof, it should of course be understood that it should not be limited only to them but various changes or modifications may be made in a suitable manner without any departure from the spirit and scope of the invention as defined by the appended claims.

## Claims

1. An optical recording card wherein a writable optical recording member is held between a card front board and a card rear board which are adhered to one another, said optical recording member includes a colored organic material layer and an aluminum deposited layer in the form of a layered structure, and the optical recording member is held between said card front board and said card rear board in such a manner that said colored organic material layer is located on the light emitting side.

2. The optical recording card of claim 1 wherein said card front board is constituted by

material having an excellent light permeability such as glass or transparent resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

3. The optical recording card of claim 1 wherein said card rear board comprises a plate made of glass or synthetic resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

4. The optical recording card of claim 1 wherein said colored organic material layer has a thickness in the range of 300 angstroms to 10 microns.

5. The optical recording card of claim 1 wherein said aluminum deposited layer has a thickness less than about 1000 angstroms.

6. A method of producing an optical recording card of the type including a writable optical recording member which is adhesively held between a card front board and a card rear board with the use of an adhesive, wherein said method comprises the steps of;

forming a colored organic material layer in an optical recording member forming region located on one surface of said transparent card front board,

next, forming an aluminum deposited layer on said colored organic material layer, and then, adhesively securing said card rear board to said card front board with the use of an adhesive in such a manner as to cover said colored organic material layer and said aluminum deposited layer.

7. The method of claim 6 wherein said card front board is constituted by material having an excellent light permeability such as glass or transparent resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

8. The method of claim 6 wherein said card rear board comprises a plate made of glass or synthetic resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

9. The method of claim 6 wherein said colored organic material layer is coated by a process of spin coating, roll coating or the like and a dried thin film thereof has a thickness in the range of 300 angstrom to 10 microns.

10. The method of claim 6 wherein said aluminum deposited layer is formed by vacuum depositing and a deposited thin film thereof has a thickness less than 1000 angstroms.

11. An optical recording card wherein an optical recording member is held between a card front board and a card rear board which are adhered to one another, said optical recording member includes a colored organic material layer and a transparent figure image forming material layer in the form of a layered

structure, and the optical recording member is held between said card front board and said card rear board in such a manner that said colored organic material layer is located on the light emitting side.

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12. The optical recording card of claim 11 wherein said card front board is constituted by material having an excellent light permeability such as glass or transparent resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

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13. The optical recording card of claim 11 wherein said card rear board comprises a plate made of glass or synthetic resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

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14. The optical recording card of claim 11 wherein said colored organic material has a thickness in the range of 300 angstroms to 10 microns.

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15. The optical recording card of claim 11 wherein said transparent figure image forming material layer has a thickness in the range of 0.1 to 5.0 microns.

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16. A method of producing an optical recording card of the type including an optical recording member between a card front board and a card rear board which are adhesively secured to one another with the use of an adhesive, wherein said method comprises the steps of;

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forming a colored organic material layer in an optical recording member forming region located on one surface of said transparent card front board,

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next, forming a transparent figure image forming layer on said colored organic material layer, and then,

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adhesively securing said card rear board to said card front board with the use of an adhesive in such a manner as to cover said colored organic material layer and said transparent figure image building material layer.

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17. The method of claim 16 wherein said card front board is constituted by material having an excellent light permeability such as glass or transparent resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

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18. The method of claim 16 wherein said card rear board comprises a plate made of glass or synthetic resin such as acrylic resin, epoxy resin, polyester resin, polyvinyl chloride resin, polysulfon resin, polyethersulfon resin, polycarbonate resin or the like.

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19. The method of claim 16 wherein said colored organic material layer is coated by a process of spin coating, roll coating or the like and a dried thin film thereof has a thickness in the range of 300 angstroms to 10 microns.

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20. The method of claim 16 wherein said

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transparent figure image forming material layer is coated by a process of spin coating, roll coating or the like and dried film thereof has a thickness in the range of 0.1 to 5.0 microns.

FIG. 1

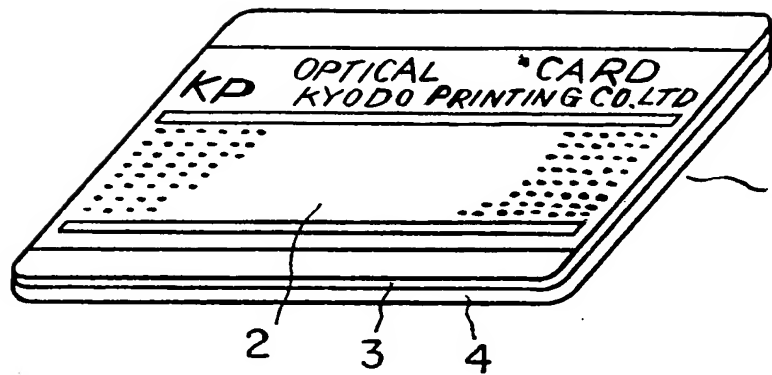
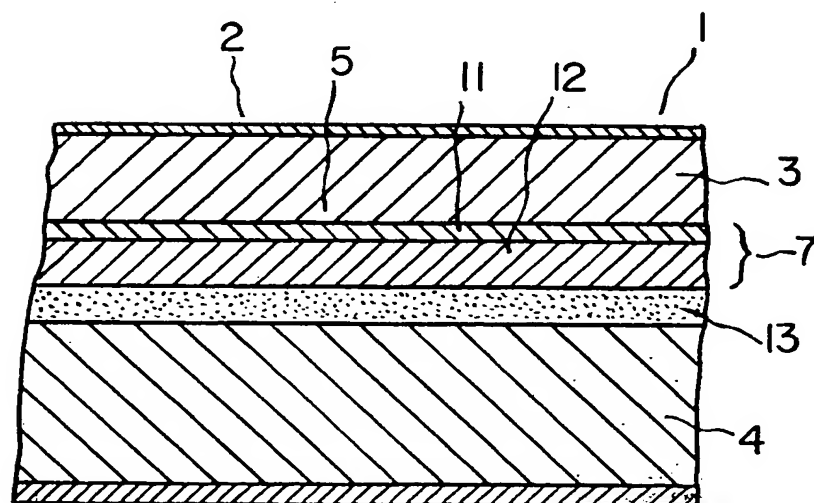


FIG. 2



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FIG. 3

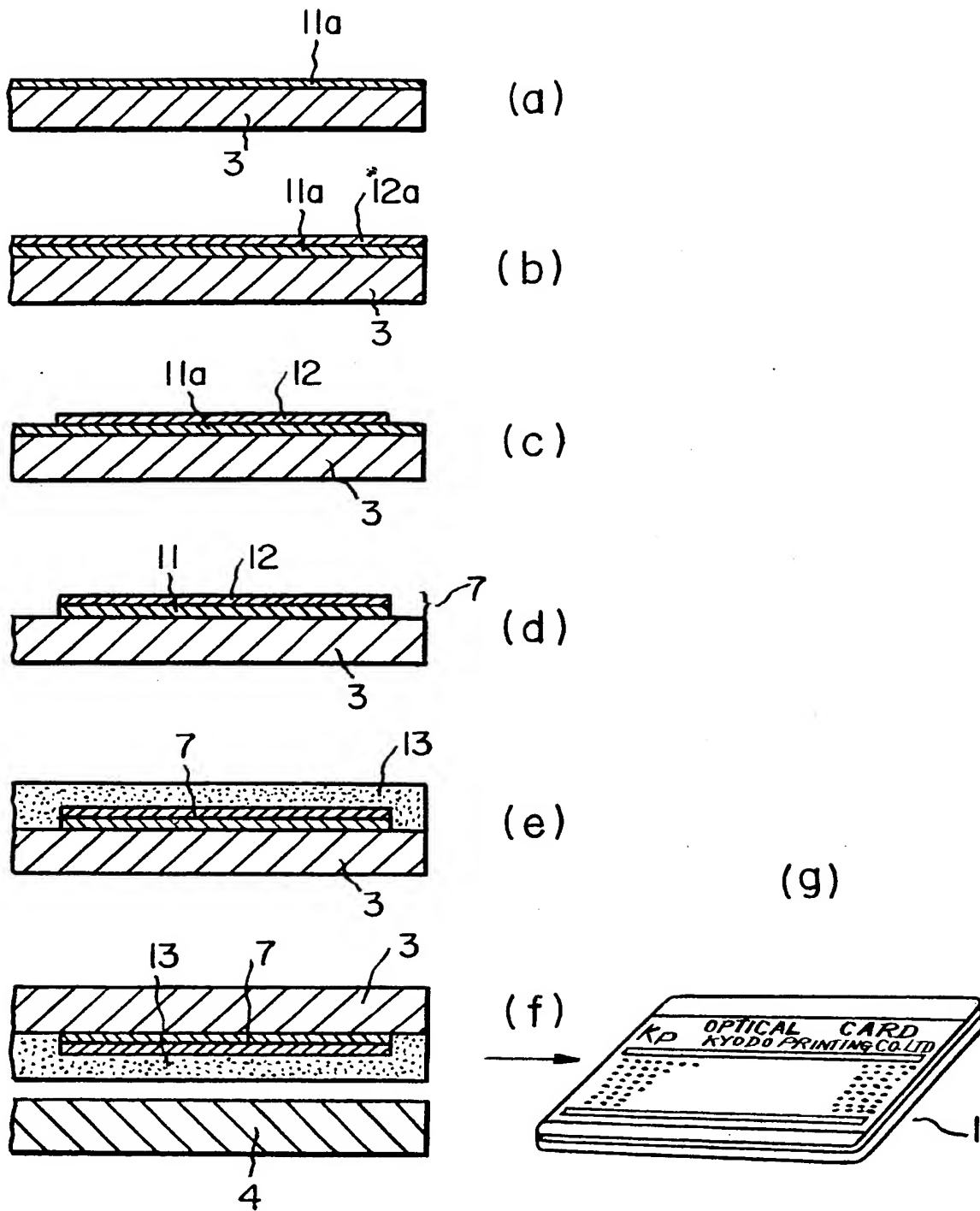




FIG. 4

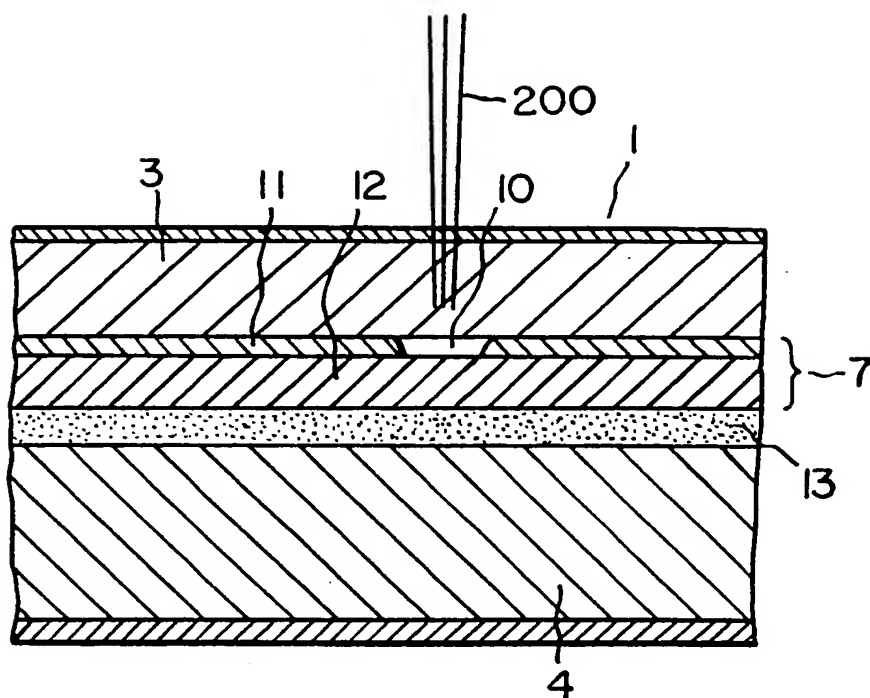


FIG. 5

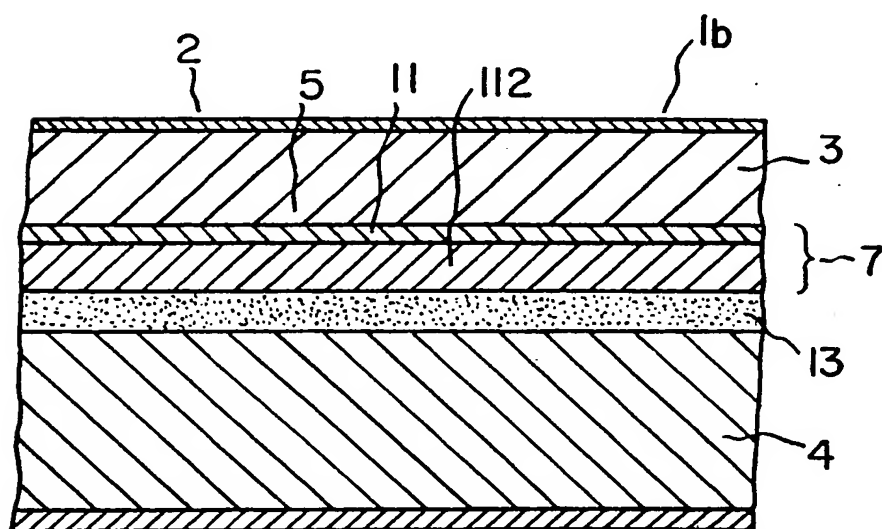


FIG. 6

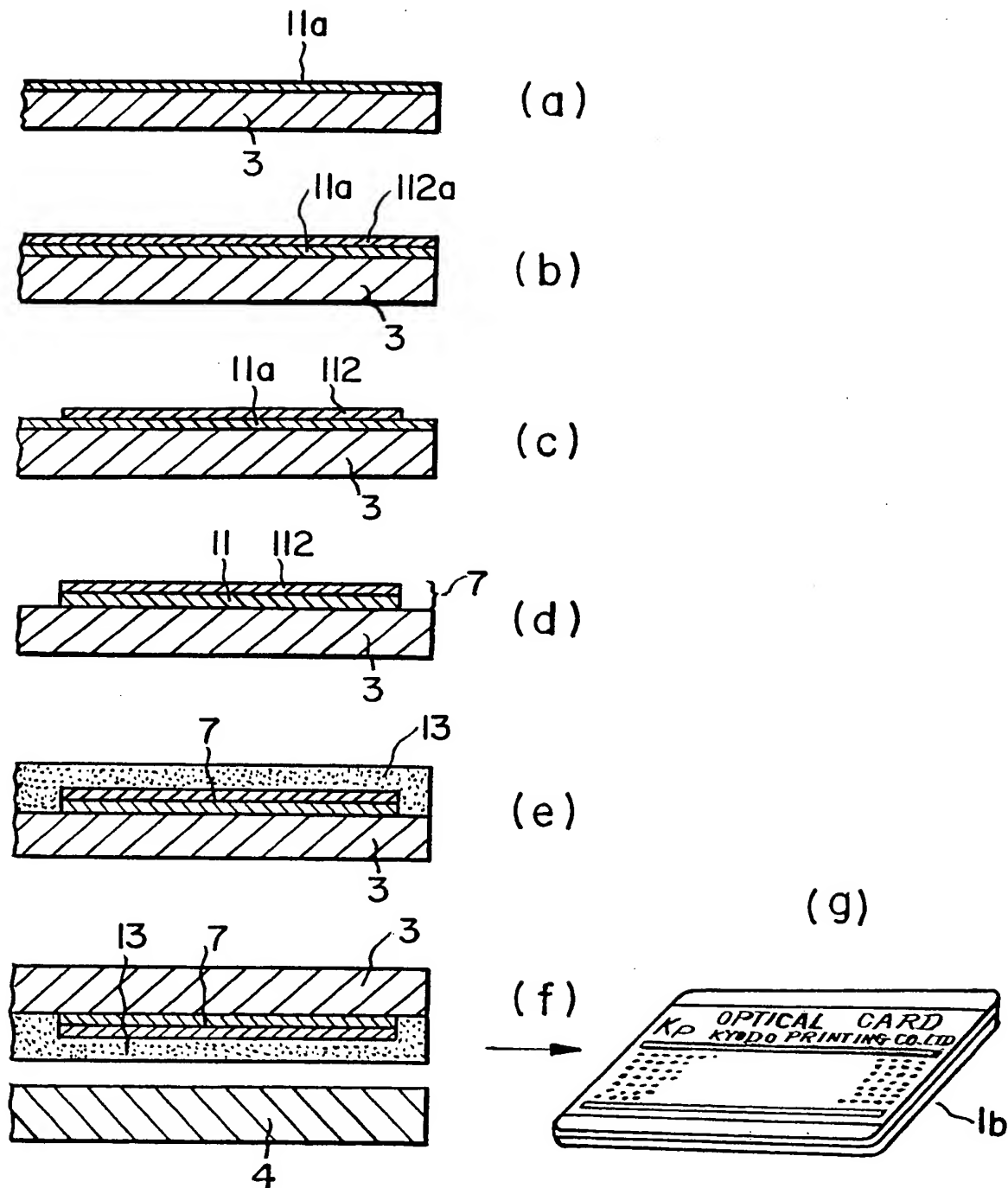


FIG. 7

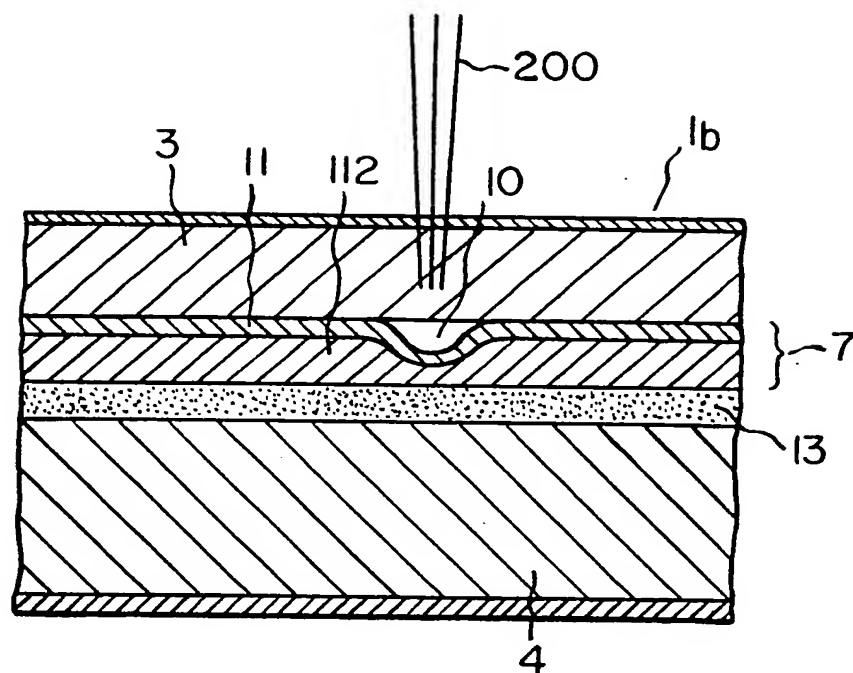
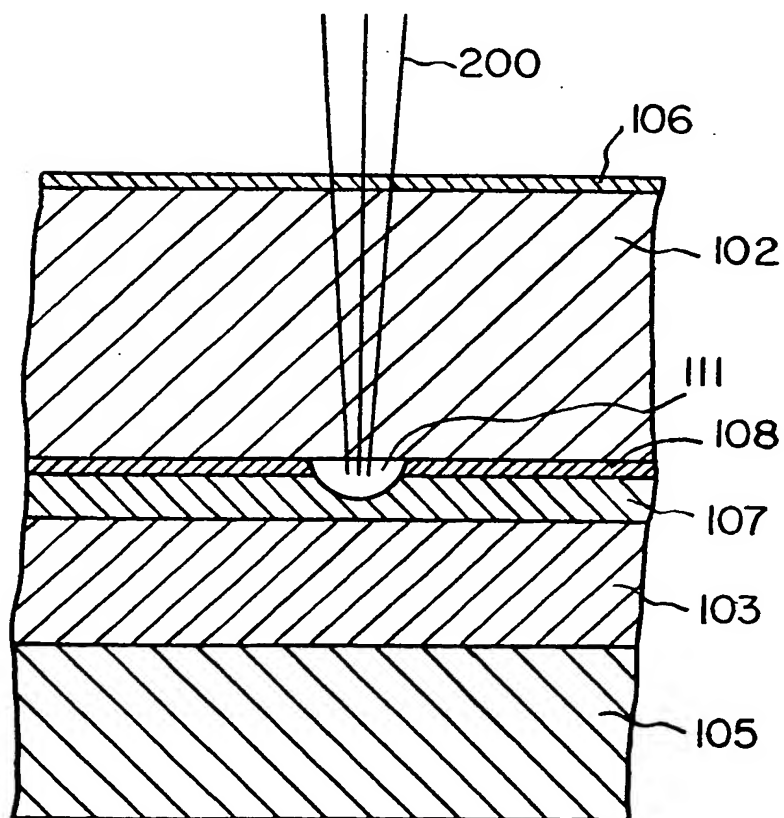


FIG. 8



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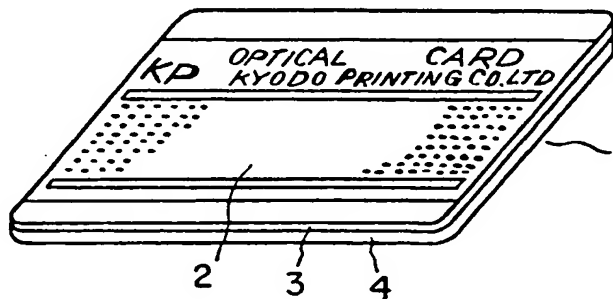
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54 **Optical recording card and method of producing the same.**

57 This invention is concerned with a DRAW type optical recording card and a method of producing the same. The optical recording card of the invention is so constructed that an optical recording member is held between a card front board and a card rear board. The optical recording member is constructed by a colored organic material layer and an aluminum deposited layer in the form of a layered structure or by a colored organic material layer and a transparent figure image forming layer in the form of a layered structure. When optical informations are written in the optical recording member, a laser beam is emitted from the outside of the card front board whereby a pit is formed on the optical recording member.

**FIG. 1**



**EP 0 272 875 A3**



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 87 31 1075

| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |  |  |
|---|---|--|--|
| Category  | Citation of document with indication, where appropriate, of relevant passages   | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4) |
| X   | EP-A-0 158 906 (DAI NIPPON)<br>* Abstract; page 4, line 22 - page 7, line 16; page 7, line 32 - page 8, lines 11,15-29; page 9, line 8 - page 13, line 10; page 18, lines 10-14,28-32; page 19, lines 27-35; page 23, lines 16-27; page 25, line 7 - page 32, line 11; claims * | 1-10   | G 11 B 7/26<br>G 06 K 19/08                    |
| A   | DE-A-2 826 122 (FUJI)<br>* Claims 1,2,4,7,9,10; page 17, paragraph 2 - page 30, paragraph 2; page 32, paragraph 2 - page 33, paragraph 1; page 35, paragraph 2 - page 36, paragraph 2; page 37, paragraph 2 - page 38, paragraph 1; figures *                                   | 1-10   |  |
| Y   | PATENT ABSTRACTS OF JAPAN, vol. 8, no. 132 (M-303)[1569], 20th June 1984; & JP-A-59 33 191 (KONISHIROKU SHASHIN KOGYO K.K.) 22-02-1984<br>* Abstract *  | 11-20  | TECHNICAL FIELDS SEARCHED (Int. Cl.4)          |
| A   | PATENT ABSTRACTS OF JAPAN, vol. 7, no. 153 (M-226)[1298], 5th July 1983; & JP-A-58 62 096 (MATSUSHITA DENKI SANGYO K.K.) 13-04-1983<br>* Abstract *   | 11-20  | G 11 B<br>G 06 K                               |
| The present search report has been drawn up for all claims  |   |  |  |
| Place of search<br>THE HAGUE  |   | Date of completion of the search<br>11-10-1989 | Examiner<br>VANHECKE H.                        |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |   |  |  |

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